American Machine Tool Co. May 1, 1958 JJ ÷13

82-117
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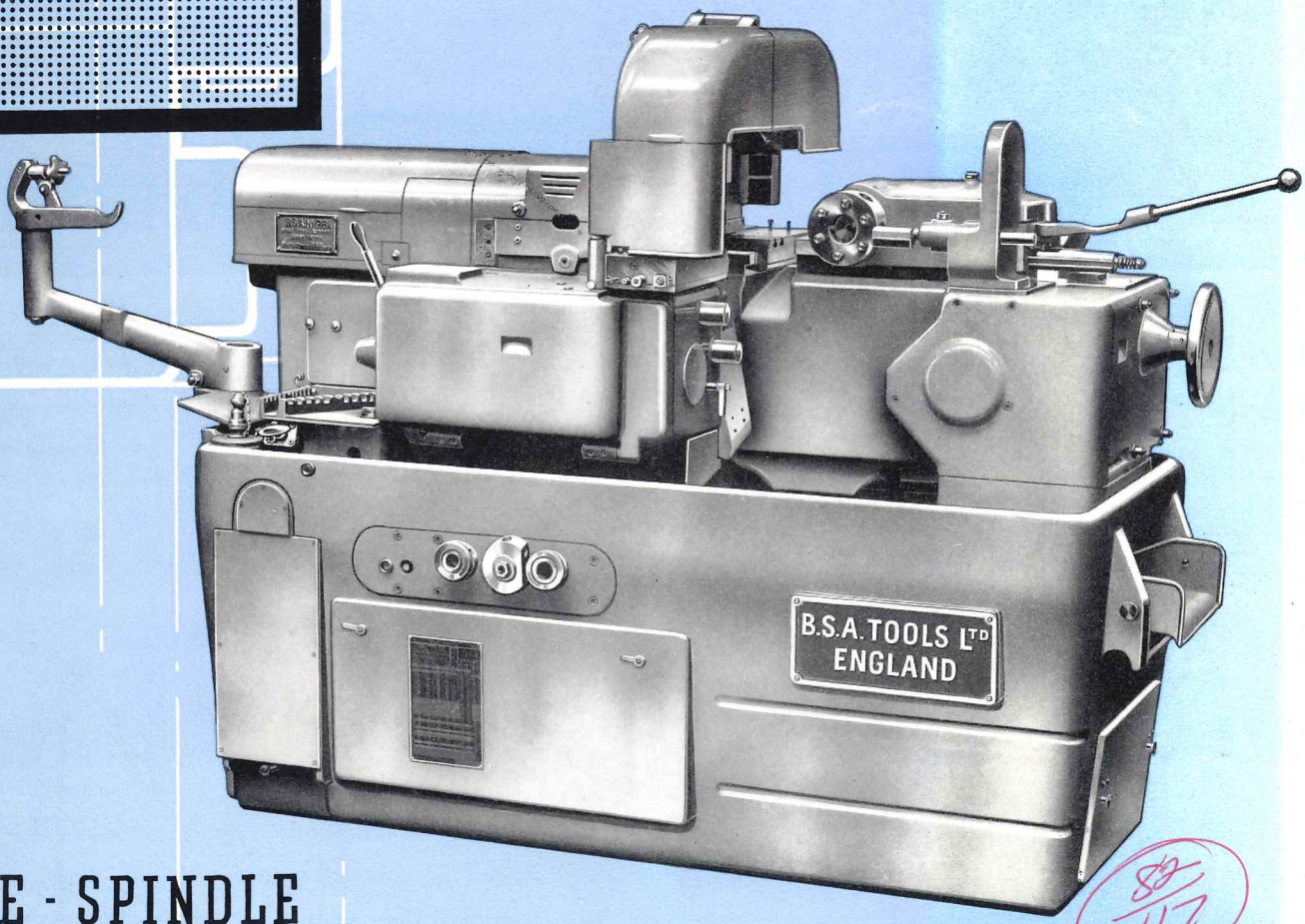
BSA

TYPE L

PLAN

DISTRIBUTED AND SERVICED
IN THE U. S. A. BY
THE NATIONAL ACME COMPANY
CLEVELAND, OHIO

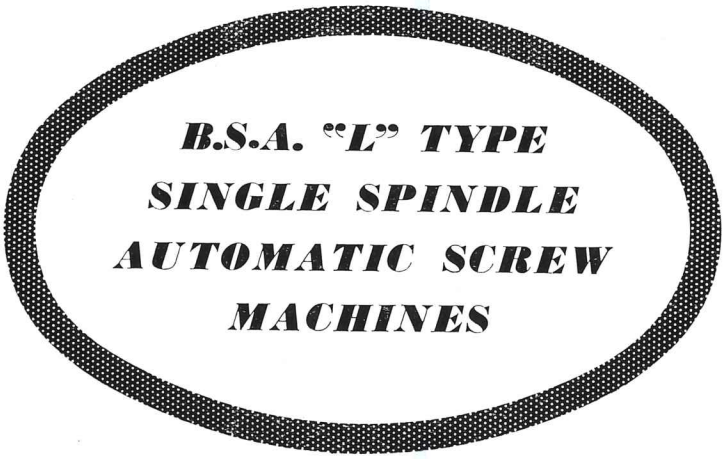
98L · 138L · 168L



82/117

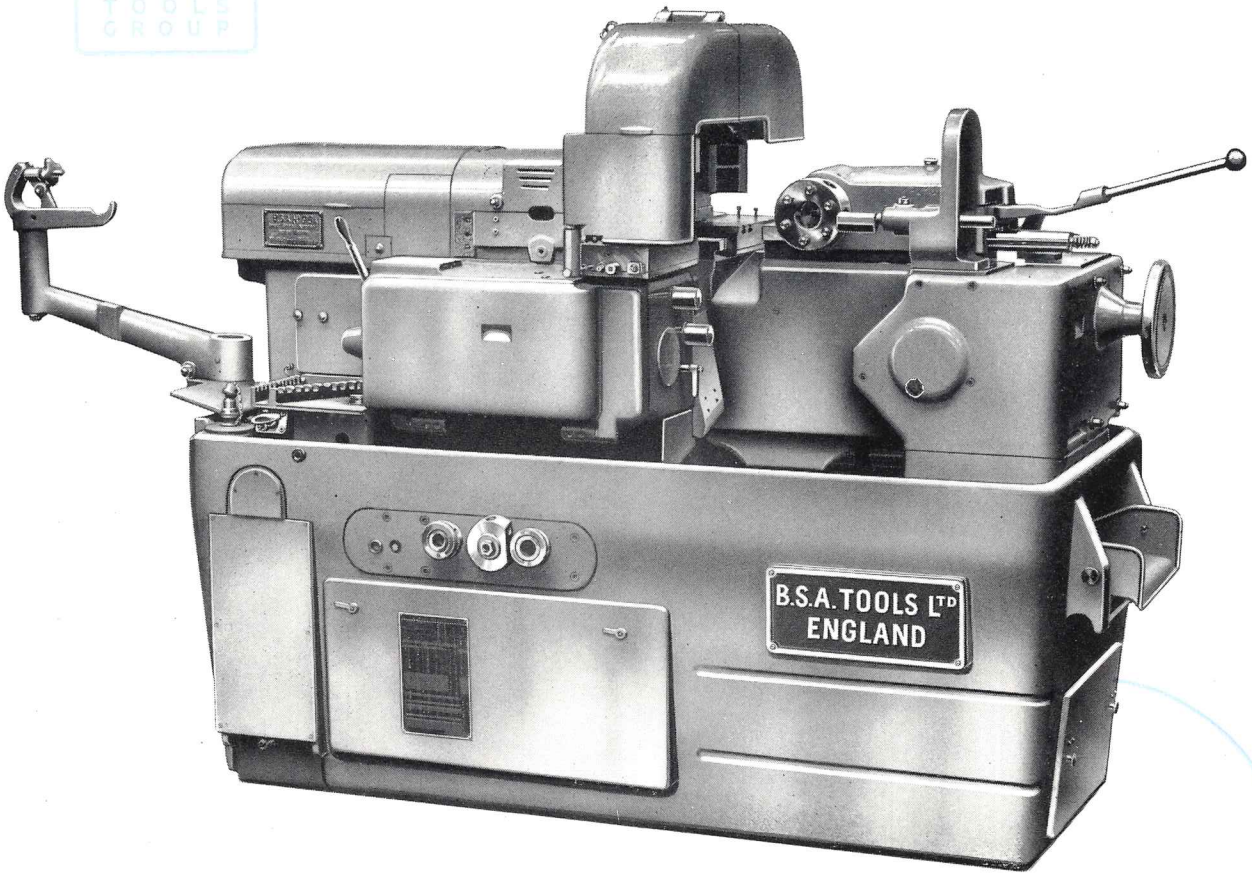
SINGLE-SPINDLE

AUTOMATIC SCREW MACHINES



2nd EDITION · JULY 1957

B. S. A. "L" TYPE SINGLE-SPINDLE



B.S.A. "L" Type Single-Spindle Automatic Screw Machines represent the latest developments in this field of design and possess every refinement for high-speed production to close limits of accuracy. This line of B.S.A. Automatic Screw Machines is presented with the aim of providing the automatic which requires an absolute minimum of attention. B.S.A. "L" Type automatics produce work at higher rates with the utmost regularity than similar machines of the same capacity. Every endeavour has been made to perfect those parts of the screw machine which, in the long experience of B.S.A. Tools Limited, are known to have given trouble in the slightest degree. The types, sizes and capacities of B.S.A. "L" Type Automatic Screw Machines are listed on page 13. Complete specifications will be found on pages 14 and 15.

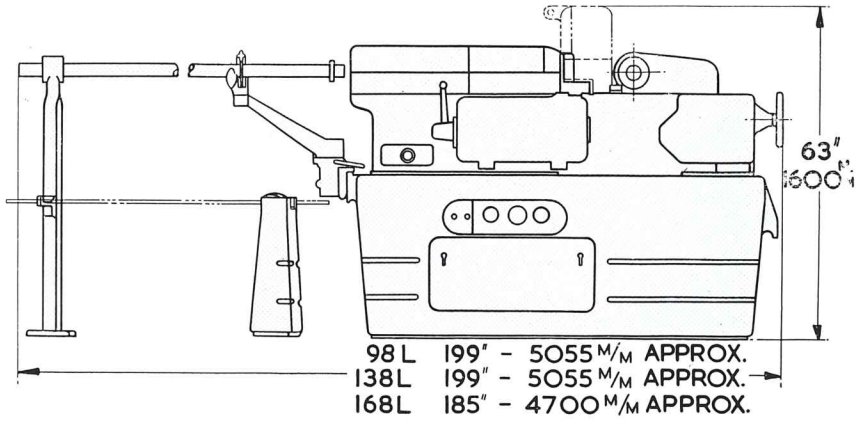
AUTOMATIC SCREW MACHINES

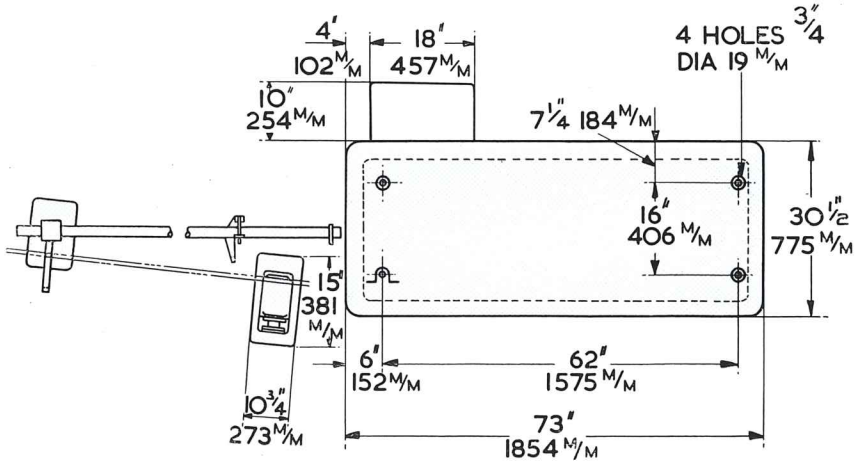
Ease of operation has received particular attention; change-over from one job to another can be accomplished rapidly and with ease. The design of the workspindle is such that high speeds can be maintained continuously and a fine finish on the workpiece is ensured.

Maximum swarf clearance is achieved by the arrangement of the body of the machine, which is designed with the entire front camshaft on the headstock side of the cross-slide, thus permitting ample space through which swarf can fall freely into the tray. Swarf can be emptied from the right-hand end of the machine during operation. An automatic conveyor may be fitted in place of the tray; swarf is then removed continuously and deposited in a receptacle provided. At no time is the swarf tray or conveyor an impediment to the toolsetter or loader.

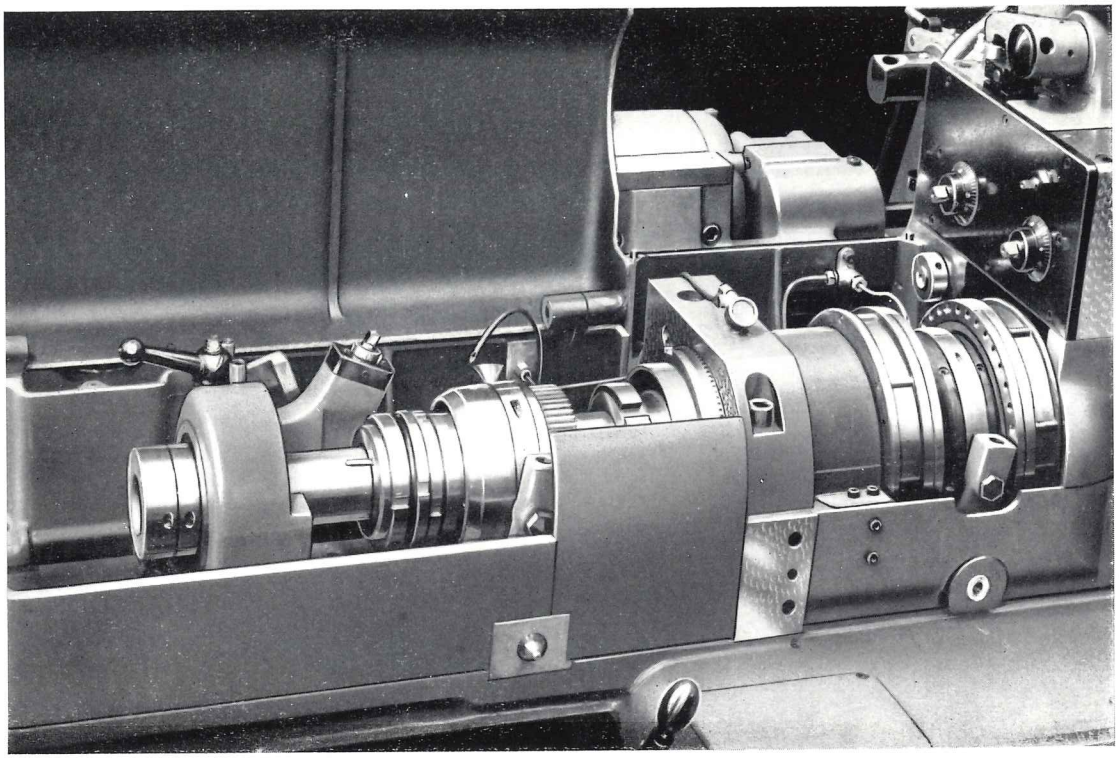
All moving parts of the machine likely to endanger an operator are entirely enclosed or otherwise safeguarded. Its exterior is free of non-essential projections to facilitate cleaning and provide a neat appearance in keeping with the overall efficiency of the machine.

FLOOR PLAN





B.S.A. "L" TYPE SINGLE-SPINDLE AUTOMATIC



Headstock cover raised showing workspindle and bearings.

Headstock and Workspindle

The No. 98L and 138L machine workspindles are mounted on taper roller bearings at the front of the headstock and taper roller bearings at the rear. The No. 168L machine workspindle is mounted on plain taper bronze bearings at the front and opposed single direction thrust bearings at the rear. The thrust on the clutch drums is also taken on single direction thrust bearings. All bearings can be replaced when excessive wear takes place. The spindle is driven through two cone-type clutches by duplex roller chains from sprockets within the apron. The chain drive is smooth, positive and allows the spindle bearings to be brought close together, resulting in a short rigid spindle. Jockey sprockets maintain correct chain tension by simple adjustment obtained through turning two controls which project from the front of the machine base. Sufficient adjustment is available to take up all permissable stretch occurring during the life of the chain. An initial amount of slackness essential for long chain-life is provided.

Spindle Speeds

A wide range of speeds and ratios in the same and reverse directions is obtained by means of pick-off gears in the apron. Easy access to pick-off gears is obtained through a large door at the front of the machine base. All shafts in the apron are carried on ball bearings and provided with automatic lubrication.

Cabinet Base

The base of the machine is well proportioned and specially arranged to facilitate the escape and easy removal of chips and swarf. It also houses the motor drive and switchgear, spindle speed gear box, change gear compartments and coolant tank. The machine is entirely self-contained and can be lifted and moved to another site with absolute freedom and minimum production delay.

Automatic Speed Changes

"AL" MACHINES

Two cone-type clutches in the apron, in conjunction with similar clutches on the work-spindle, enable two forward and two reverse spindle-speeds to be obtained automatically, giving a total of four spindle speeds in one cycle of the machine.

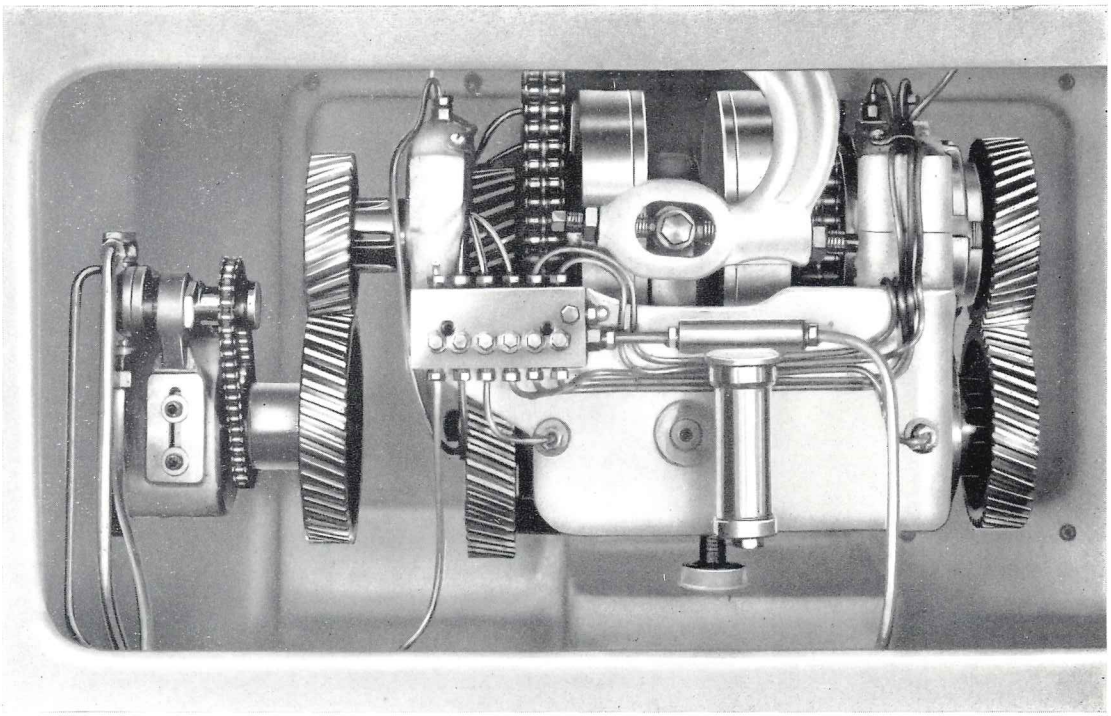
"BL" MACHINES

The workspindle clutches on this machine automatically provide one forward and one reverse speed. Or alternatively, two speeds in either forward or reverse direction. The clutches which are easily accessible for adjustment are operated from the camshaft and impart a rapid and positive movement.

Motor Drive

The foot-mounted motor at the rear of the base drives the main drive shaft through V-Belts. Belt tension is easily adjusted without removing covers.

Spindle-speed gear box ("AL" type machine, illustrated), showing pick-off gears for varying the spindle-speeds.

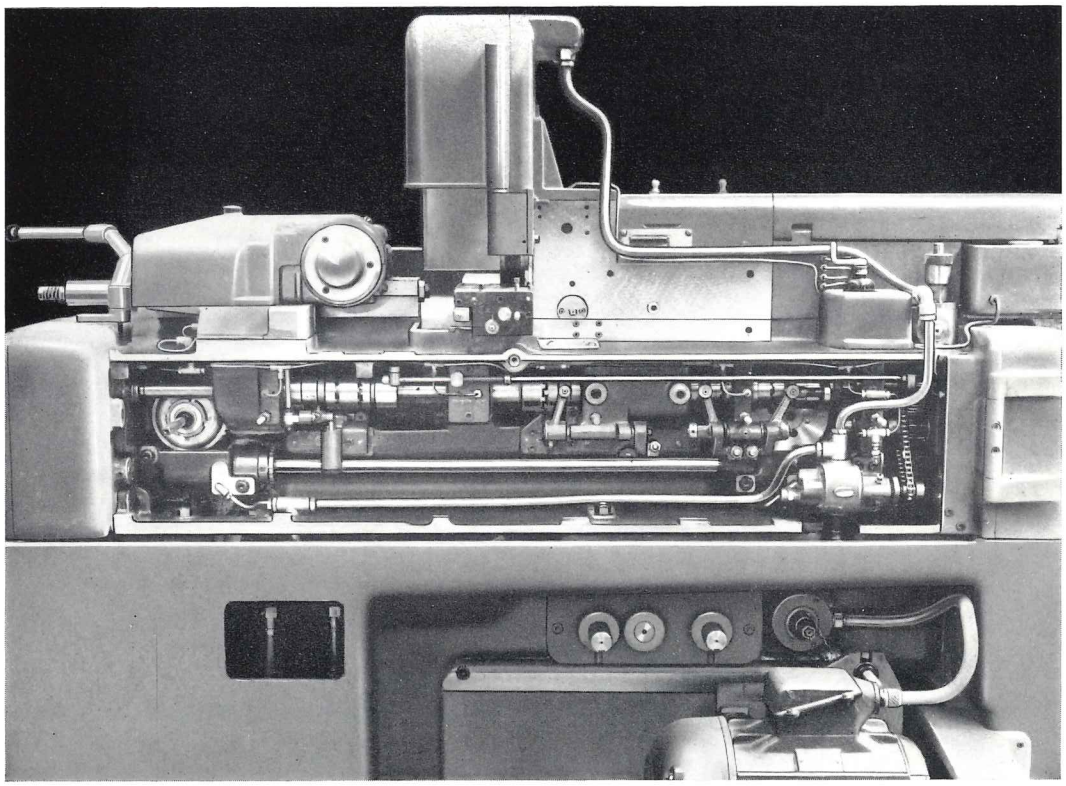


Backshaft

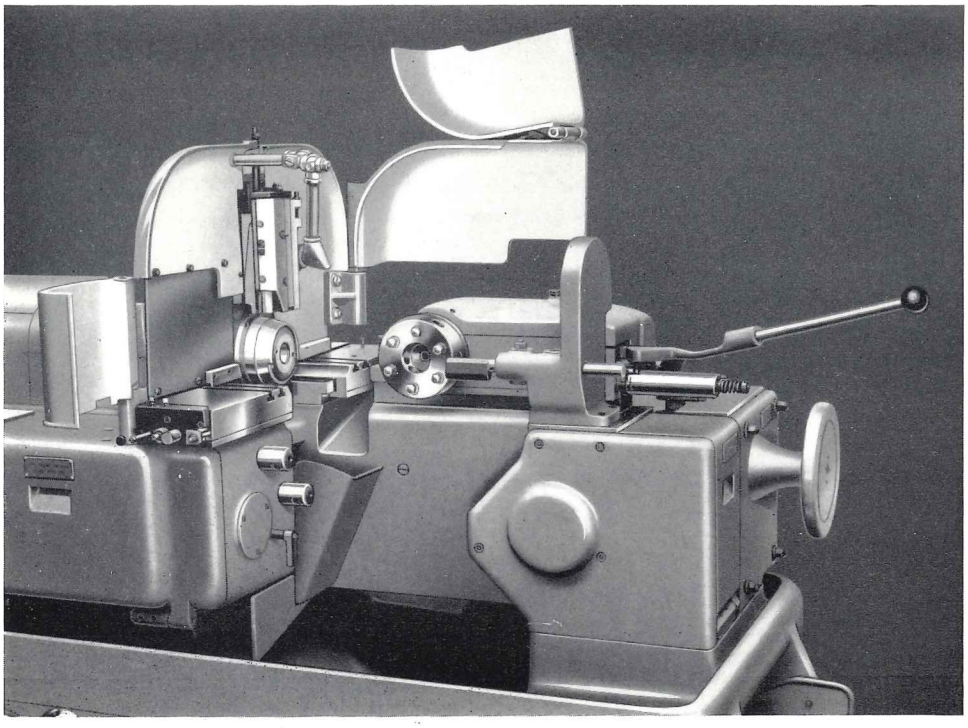
This is driven at a constant speed by belt from the main drive shaft, backshaft engagement being controlled through a lever-operated clutch. A hand-wheel is provided for rotating the shaft manually when setting-up.

The dog clutches controlling the movements of the workspindle and on "A" Type machines the clutches in apron, stock feeding, collet opening and closing cams and turret indexing mechanism are all mounted on the back-shaft and operated by adjustable trips on the front and turret camshafts. The backshaft and clutch tripping mechanism is totally enclosed under fitting covers thus preventing trouble due to the entry of swarf and dirt.

Covers removed from rear of machine to show the complete back-shaft assembly



TRADE MARKS
B S A



Guards opened to show turret, cross slides and third slide. Note ample space for swarf clearance.

Turret

The turret slide moves on large square section ways; a taper gib is provided for taking up wear. The slide is solidly constructed to give maximum rigidity to turret tools when taking heavy turning cuts.

The vertical turret is made of heat-treated steel and has six stations for standard tools. A full range of tools for these machines is listed on pages 17 and 18.

A valuable feature of B.S.A. Automatic Screw Machines is that the turret can be adjusted forward or backwards in relation to the slide. This facilitates tool setting and is an effective time saver where parts are being produced in various lengths.

The feed of the turret slide is actuated by cam-operated quadrant and rack.

The turret indexing mechanism operates through a link and Geneva motion, ensuring a smooth and rapid movement.

Cross Slides

These are of hardened steel on ways of ample proportions, and are operated by cams on the front camshaft. To facilitate speedy adjustment when setting-up, the cams are mounted on serrated sleeves.

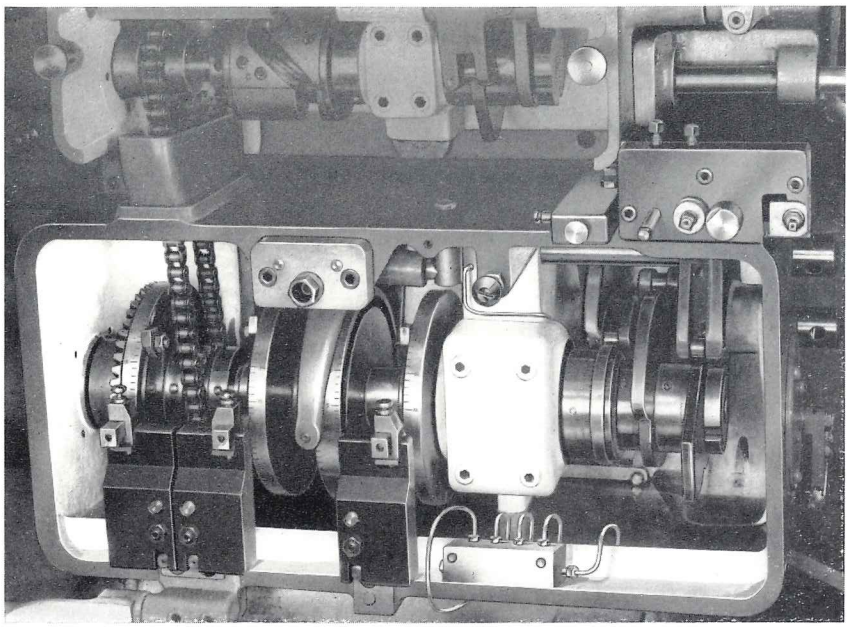
The mechanism which transmits motion from the cams to the cross slides has been kept as simple as possible and is easily accessible.

Adjustment is provided for setting the cross slides forwards or backwards relative to the spindle.

Provision is made for fitting a third or vertical slide when required, the motion for this is taken from an additional cam on the front camshaft.

Cross slides and third slide may be hand operated without opening the camshaft cover.

Alternatively a double top slide can be fitted. One slide operating from an additional cam on the front camshaft, the other obtaining its movement from a second cam located on an auxiliary shaft.



The front camshaft with its cover lowered.

Camshafts-Front & Turret

These control the cross slides, stock-feed, spindle-speed change and reversal, and turret cam drive. The camshafts are driven from the backshaft through a worm drive and pick-off gears, providing 106 different cycle times which are entirely independent of the spindle speeds.

The usual method of tripping the backshaft clutches by long levers passing through the machine has been dispensed with in favour of operation by pull rods. The tripping point is directly in front of the camshaft so facilitating setting of trips.

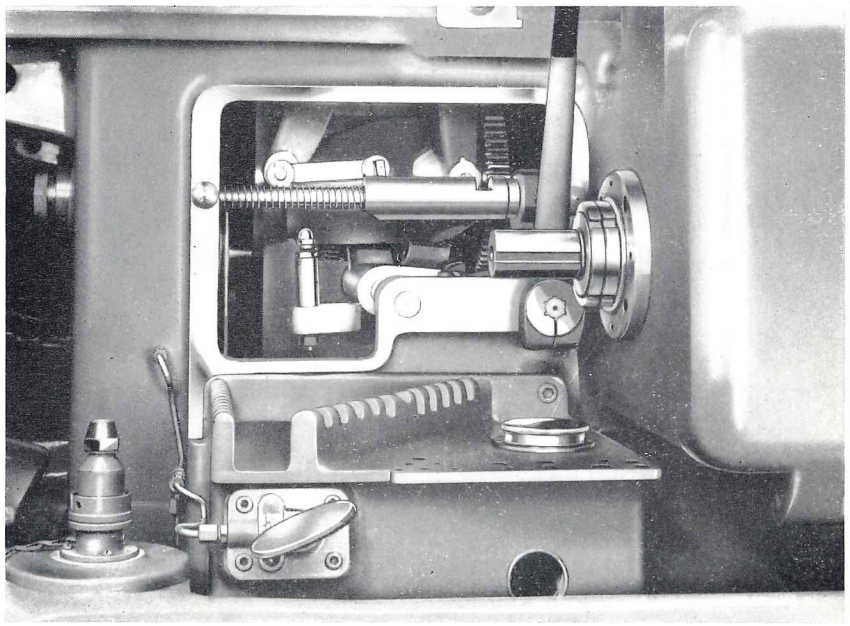
The front and turret camshafts are both totally enclosed, but are readily accessible when their hinged covers are opened.

Bar Feed

Collet opening and closing and forward and return movements of the bar feed tube carrying the feed finger are controlled by trip dogs clamped to the face of the front shaft bevel gear.

Provision is made for adjusting the length of bar feed at each revolution of the cam, the maximum feed being 4″ on the Long Stroke machine, and $2\frac{1}{2}$″ on the Short Stroke machine.

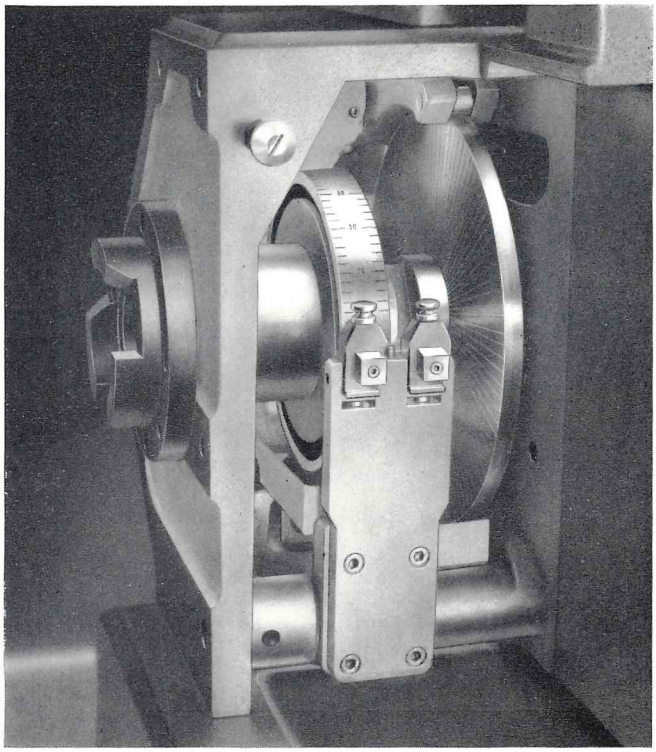
An automatic stopping device incorporated in the bar feed mechanism stops all movements of the machine, with the exception of the work-spindle, when the end of the bar stock is reached, thus avoiding breakage of tools through the bar end being of insufficient length.



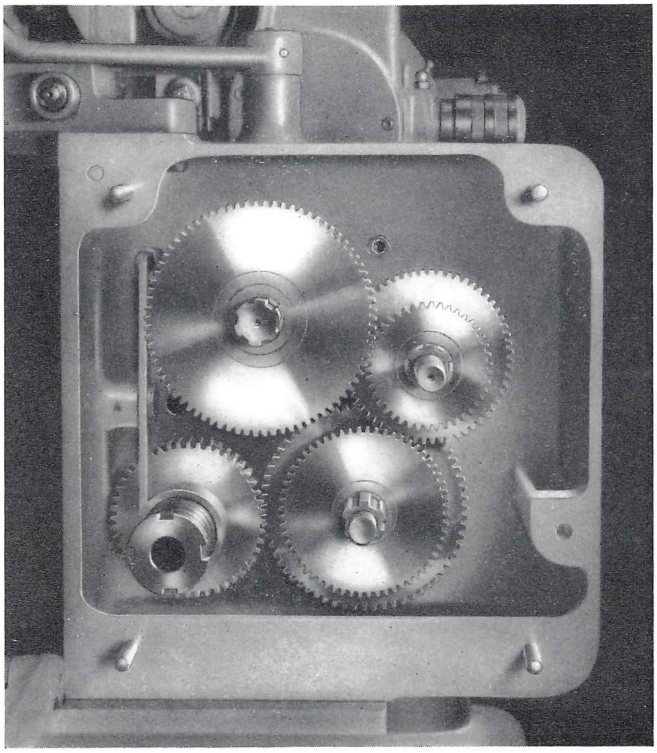
Bar feed mechanism incorporating the automatic stopping device.

TRADE MARKS
B·S·A TOOLS LIMITED

Turret camshaft, indexing trip mechanism and camshaft for attachment transfer unit.



The camshafts are driven from the backshaft through a worm drive and pick-off gears, providing 106 different cycle times.



Camshaft Drive

The gearbox for obtaining the cycle times is of the constant centre type and is totally enclosed with the gears running in oil. A device is incorporated which disengages the backshaft clutch if the machine becomes over-loaded. The worm-drives to the two camshafts have independent adjustment for mesh and end-play. Both worms run in oil baths.

Workchute

This is operated from two adjustable dogs on the front camshaft and effectively separates swarf from the work. The timing of its opening and closing may be varied without the use of special cams.

Coolant

Pump and fittings are included and ensure an ample supply of filtered coolant at a constant pressure. Tank capacity 12 gallons (54·2 litres).

Lubrication

The spindle speed gear box has its own large oil sump and pump which, with its strainer, is placed accessibly, adjacent to the gear box.

All principal bearings have automatic lubrication. Workspindle bearings and cross slides are fed from a pump which is gear driven from the backshaft. Another pump, chain driven from the main drive shaft, feeds bearings, chains, and gears within the apron.

Other bearings are lubricated from a built-in hand pump located at the front of the machine. The supply of oil is controlled by valves in the oil feed pipes which ensure even lubrication to each individual bearing. The shaft bearings are splash lubricated by separate oil wells.

The cams and trip drum dogs dip into an oil reservoir and these, in turn, lubricate the cam rollers and trips.

Both worms in the front and turret camshaft drives run in oil baths.

Total oil requirements are 14 pints (7·91 litres).

Standard Equipment

All machines are arranged for self-contained motor drive, including V-Belts and pulleys, but exclusive of electrical equipment.

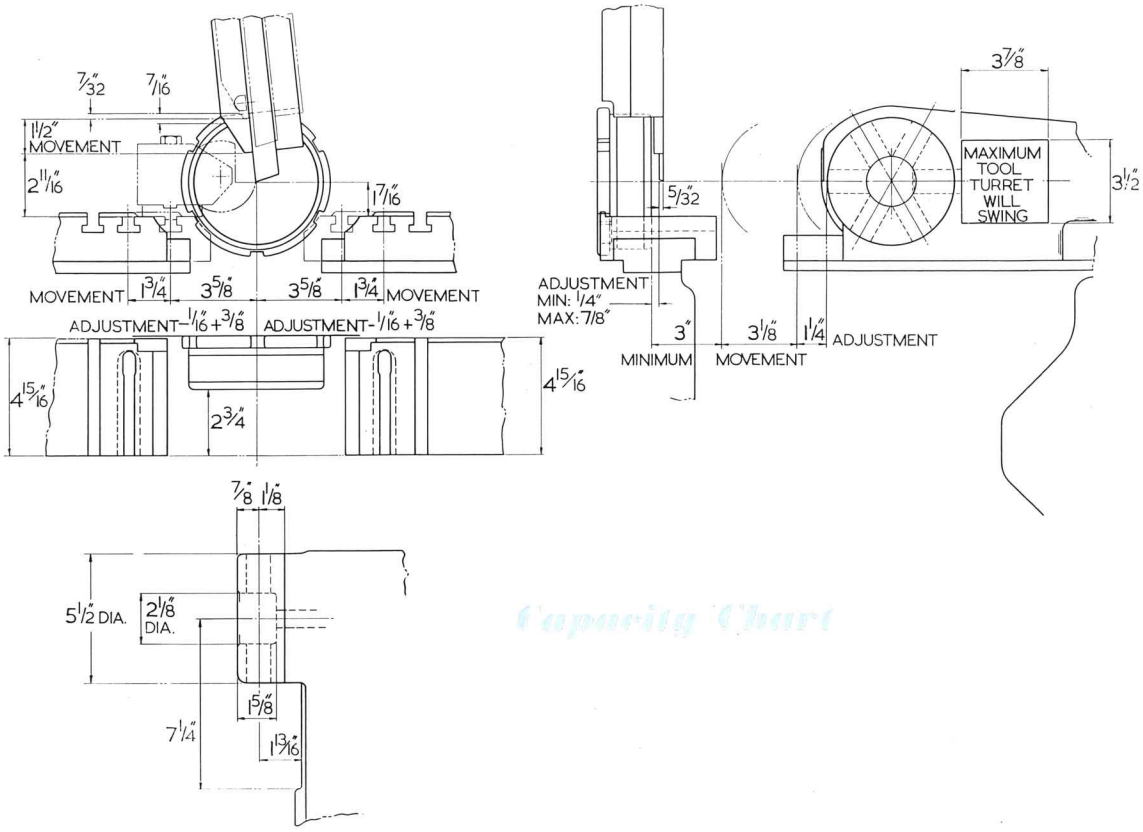
Standard Equipment included with each machine comprises:

- One collet and feed finger.
- Turret double-indexing parts.
- Two cross slide cam blanks.
- One lead cam blank.
- One set pick-off gears for work-spindle speeds:
  - (8 gears with "AL" machines).
  - (12 gears with "BL" machines).
- One set pick-off gears for cycle times.
- Two spacing collars.
- Bar tube support.
- One bar tube.
- Pumps and fittings.
- Splash guards.
- Tool kits.

Additional Equipment

A wide range of tools and attachments, greatly increasing the scope of the machines, can be supplied as extras. These are listed on pages 17 and 18, and further details are given in a catalogue "Tools and Attachments for Single-Spindle Automatic Screw Machines," a copy of which will be sent on request.

TRADE MARKS



Capacity Chart

Type	Capacity	Round ins.	Round m/m	Square ins.	Square m/m	Hex. A/F ins.	Hex. A/F m/m	Speeds per Cycle	Turret
98 AL	Using Standard Feed Finger ...	1	25.4	11/16	17.5	13/16	20.6	Two automatic changes in FORWARD and REVERSE directions	LONG or SHORT stroke
	Using Extra Size Feed Tube (for LIGHT FEEDS ONLY) ...	1 1/8	28.6	25/32	19.8	31/32	24.6		
	Using Outside Feeding Attachm't	1 3/8	34.9	.972	24.7	1.190	30.3		
98 BL	Using Standard Feed Finger ...	1	25.4	11/16	17.5	3/16	20.6	One automatic Change FORWARD and one REVERSE, or alternatively two speeds in either direction	LONG or SHORT stroke
	Using Extra Size Feed Tube (for LIGHT FEEDS ONLY) ...	1 1/8	28.6	25/32	19.8	31/32	24.6		
	Using Outside Feeding Attachm't	1 3/8	34.9	.972	24.7	1.190	30.3		
138 AL	Using Standard Feed Finger ...	1 5/8	41.3	1 1/8	28.6	1 3/8	34.9	Two automatic changes in FORWARD and REVERSE directions	LONG or SHORT stroke
	Using Outside Feeding Attachm't	1 3/4	44.5	1.24	31.5	1.480	37.6		
138 BL	Using Standard Feed Finger ...	1 5/8	41.3	1 1/8	28.6	1 3/8	34.9	One automatic change FORWARD and one REVERSE, or alternatively two speeds in either direction	LONG or SHORT stroke
	Using Outside Feeding Attachm't	1 3/4	44.5	1.24	31.5	1.480	37.6		
168 AL	Using Standard Feed Finger ...	2	50.8	1.414	36.0	1.730	44.0	Two automatic changes in FORWARD and REVERSE directions	LONG stroke only
	Using Outside Feeding Attachm't	2 3/8	59.3	1.659	42.1	2.056	52.9		

Complete specifications of the above will be found on pages 14 and 15.

NOTE: The "L" type machine uses the same standard toolholders for cross slides and turret as its predecessor of the same capacity, namely, No. 98 — 1 1/8", No. 138 — 1 5/8", and No. 168 — 2" diameter maximum capacity.

B.S.A. "L" TYPE SINGLE-SPINDLE AUTOMATIC

SPECIFICATION

Largest stock taken by standard feed finger	Round ... ...
	Square ... ...
	Hexagon A/F ... ...
Largest stock using outside feeding attachment	
Largest stock taken with extra size feed tube for light feeds only	Round ... ...
	Square ... ...
	Hexagon A/F ...
Diameter of hole through standard feed tube	
Maximum length dealt with at one movement—Short stroke machines	Turned ...
	Fed ... ...
Maximum length dealt with at one movement—Long stroke machines	Turned ...
	Fed ... ...
Maximum diameter Threaded using Diehead (dependant on length of thread)	
Maximum diameter Threaded using Thread Cutting Attachment	
Number of spindle speeds	Type "A" machines ... ...
	Type "B" machines ... ...
Fastest spindle speed, r.p.m.	Type "A" machines ... ...
	Type "B" machines ... ...
Slowest spindle speed, r.p.m.	Type "A" machines ... ...
	Type "B" machines ... ...
Number of cycle times	
Change feed gears to give one rev. of cams, seconds—Short stroke machines	Fastest ...
	Slowest ...
Change feed gears to give one rev. of cams, seconds—Long stroke machines	Fastest ...
	Slowest ...
Actual time allowed to feed stock, seconds	Short stroke machines ... ...
	Long Stroke machines ... ...
Actual time allowed for automatically changing speed, seconds	Short stroke machine ...
	Long stroke machine ...
Diameter of turret	
Number of holes in turret	
Diameter of holes in turret	
Maximum distance tool can project from turret	
Maximum diameter tool that turret will swing	
Distance from chuck to turret	(Maximum) ... ...
	(Minimum) ... ...
Adjustment of turret slide	
Centre of spindle to top of cross slide	
Movement of cross slide	
H.P. of motor required	
Speed of motor recommended, r.p.m.	
Floor space occupied	
Approximate weight, cwts.	
Approximate shipping dimensions	

TRADE MARKS
B·S·A TOOLS GROUP

SCREW MACHINES

No. 98L	No. 138L	No. 168L
1″ 25.4 m/m	1 5/8″ 41.3 m/m	2″ 50.8 m/m
11/16″ 17.5 m/m	1 1/8″ 28.6 m/m	1.414″ 36 m/m
13/16″ 20.6 m/m	1 3/8″ 34.9 m/m	1.730″ 44 m/m
1 3/8″ 34.9 m/m	1 3/4″ 44.5 m/m	2 3/8″ 59.3 m/m
1 1/8″ 28.6 m/m	Not applicable	Not applicable
25/32″ 19.8 m/m	Not applicable	Not applicable
31/32″ 24.6 m/m	Not applicable	Not applicable
1 1/16″ 27 m/m	1 11/16″ 43.9 m/m	2 1/8″ 54 m/m
2″ 50.8 m/m	2″ 50.8 m/m	Not applicable
2 1/2″ 63.5 m/m	2 1/2″ 63.5 m/m	Not applicable
3″ 76.2 m/m	3″ 76.2 m/m	3″ 76.2 m/m
4″ 101.6 m/m	4″ 101.6 m/m	4″ 101.6 m/m
1″ 18 T.P.I. 25.4 m/m	1 1/4″ 14 T.P.I. 31.8 m/m	1 1/4″ 14 T.P.I. 31.8 m/m
1 3/8″ 34.9 m/m	1 7/8″ 47.6 m/m	2 3/8″ 59.35 m/m
62	70	60
75	68	Not applicable
3490	2300	1520
3590	2540	Not applicable
70	78	69
32	25	Not applicable
106	106	106
3	3	Not applicable
350	350	Not applicable
6	6	6
700	700	700
1/2	1/2	Not applicable
1	1	1
1/8	1/8	Not applicable
1/4	1/4	1/4
5 1/2″ 139.7 m/m	5 1/2″ 139.7 m/m	5 1/2″ 139.7 m/m
6	6	6
1″ 25.4 m/m	1″ 25.4 m/m	1″ 25.4 m/m
3 7/8″ 98.4 m/m	3 7/8″ 98.4 m/m	3 7/8″ 98.4 m/m
3 1/2″ 88.9 m/m	3 1/2″ 88.9 m/m	3 1/2″ 88.9 m/m
7 3/8″ 187.4 m/m	7 3/8″ 187.4 m/m	7 3/8″ 187.4 m/m
3″ 76.2 m/m	3″ 76.2 m/m	3″ 76.2 m/m
1 1/4″ 31.7 m/m	1 1/4″ 31.7 m/m	1 1/4″ 31.7 m/m
1 7/16″ 36.5 m/m	1 7/16″ 36.5 m/m	1 7/16″ 36.5 m/m
1 3/4″ 44.5 m/m	1 3/4″ 44.5 m/m	1 3/4″ 44.5 m/m
5	5	5
950	950	950
16′ 7″ × 3′ 10 1/2″	16′ 7″ × 3′ 10 1/2″	15′ 5″ × 3′ 10 1/2″
nett, 42 gross, 46	nett, 42 gross, 46	nett, 42 gross, 46
89″ × 42″ × 64″	89″ × 42″ × 64″	89″ × 42″ × 64″

B.S.A. "L" TYPE SINGLE-SPINDLE AUTOMATIC

Machine Price Code

B.S.A. 98L Single-Spindle Automatic Screw Machine

with $1\frac{1}{8}$" dia. maximum capacity, open front body, providing maximum swarf disposal, large oil capacity cabinet base, fully enclosed bar feed and turret mechanism, variable ratios for threading, and provision for mechanical swarf conveyor, arranged for self-contained vee-rope motor drive, including vee-ropes and pulleys, but exclusive of electrical equipment. **STANDARD EQUIPMENT** included with machine comprises: Turret Double Indexing Parts, 1 Collet and Feed Finger, 1" dia., 2 Cross Slide Cam Blanks, 1 Lead Cam Blank, 1 set Pick-off Gears for work spindle speed: (10 Gears with "AL" Type Machine), (12 Gears with "BL" Type Machine), 1 set (22) Pick-off Gears for cycle times, Bar Tube Support, 1 Silent Bar Tube, 2 Spacing Collars, Pumps and fittings, Splash Guards and Tool Kit.

		Code Word
MACHINE AS ABOVE ("AL" Type giving 4 automatic changes of speed:	Standard Long Stroke	**98LSAL**
	Short Stroke (to order)	**98SSAL**
MACHINE AS ABOVE ("BL" Type) giving 2 automatic changes of speed:	Standard Long Stroke	**98LSBL**
	Short Stroke (to order)	**98SSBL**

DRIVE UNIT

5 h.p. Squirrel Cage Foot Mounting Motor, 950 r.p.m., suitable for 220/380/420 volts, 3-phase, 50 cycles A.C. supply **98SSM**

STARTER

Special Vertical control panel with three Overloads, Isolator and main and attachments H.R.C. fuses, "Start" and "Stop" push button station and Rotary reversing switch **98SSSA**

For "BL" type machine—as above **98SSSB**

B.S.A. 138L Single-Spindle Automatic Screw Machine

with $1\frac{5}{8}$" dia. maximum capacity, open front body, providing maximum swarf disposal, large oil capacity cabinet base, fully enclosed bar feed and turret mechanism, variable ratios for threading, and provision for mechanical swarf-conveyor, arranged for self-contained vee-rope motor drive, including vee-ropes and pulleys, but exclusive of electrical equipment. **STANDARD EQUIPMENT** included with machine comprises: Turret Double Indexing Parts, 1 Collet and Feed Finger $1\frac{5}{8}$" dia., 2 Cross Slide Cam Blanks, 1 Lead Cam Blank, 1 Set Pick-off Gears for work spindle speed: (10 gears with "AL" Type Machine), (12 gears with "BL" Type Machine), 1 Set (22) Pick-off Gears for cycle times, Bar Tube Support, 1 Silent Bar Tube, 2 Spacing Collars, Pumps and fittings, Splash Guards and Tool Kit.

		Code Word
MACHINE AS ABOVE ("AL" Type) giving 4 automatic changes of speed:	Standard Long Stroke	**138LSAL**
	Short Stroke (to order)	**138SSAL**
MACHINE AS ABOVE ("BL" Type) giving 2 automatic changes of speed:	Standard Long Stroke	**138LSBL**
	Short Stroke (to order)	**138SSBL**

DRIVE UNIT

5 h.p. Squirrel Cage Foot Mounting Motor, 950 r.p.m., suitable for 220/380/420 volts, 3 phase, 50 cycles, A.C. supply **138SSM**

STARTER

Special Vertical control panel with three Overloads, Isolator and main and attachments H.R.C. fuses, "Start" and "Stop" push button station and Rotary reversing switch **138SSSA**

For "BL" type machine—as above **138SSSB**

B.S.A. 168L Single-Spindle Automatic Screw Machine

with 2" diameter maximum capacity, open front body, providing maximum swarf disposal, large oil capacity cabinet base, fully enclosed bar feed and turret mechanism, variable ratios for threading, and provision for mechanical swarf conveyor, arranged for self-contained vee-rope motor drive, including vee-ropes and pulleys, but exclusive of electrical equipment. **STANDARD EQUIPMENT** included with machine comprises: Turret Double Indexing Parts, 1 Collet and Feed Finger 2" dia., 2 Cross Slide Cam Blanks, 1 Lead Cam Blank, 1 set (10) Pick-off Gears for work spindle speed, 1 set (22) Pick-off Gears for cycle times, Bar Tube Support, 1 Bar Tube, 2 Spacing Collars, Pumps and fittings, Splash Guards and Tool Kit.

		Code Word
MACHINE AS ABOVE ("AL" Type) giving 4 automatic changes of speed:	Standard Long Stroke	**168LSAL**

DRIVE UNIT

5 h.p. Squirrel Cage Foot Mounting Motor, 950 r.p.m., suitable for 220/380/440 volts, 3-phase 50-cycles A.C. supply **168SSM**

STARTER

Special Vertical control panel with three Overloads, Isolator and main and attachments H.R.C. fuses, "Start" and "Stop" push button station and Rotary reversing switch **168SSS**

Extras

	Drawing No. and Code Word — MACHINE No. 98L	No. 138L	No. 168L
ATTACHMENTS			
Outside Feeding Attachment	1½-277AR	1½-277AR	1½-277AR
Third Slide	10S-157AR	10S-157AR	10S-157AR
Double Top Slide	10S/167AR	10S/167AR	10S/167AR
Deep Hole Drilling Attachment	10S/153AR	10S/153AR	10S/153AR
Screw Slotting Attachment—motor driven, including transfer unit	1½-40A	1½-40A	1½-40A
Burring or Rear End Drilling Attachment—motor driven, including transfer unit	1½-134AR	1½-134AR	1½-134AR
Revolving Drilling Attachment—motor driven	1-1½-65A	1-1½-65A	1-1½-65A
Revolving Drill Holder (Additional)	1-1½-2166	1-1½-2166	1-1½-2166
Drill Collets for above	1-1½-2165	1-1½-2165	1-1½-2165
Swing Stock Stop	10S/159AR	10S/159AR	10S/159AR
Internal Coolant Supply for Turret Tools	1-1½-43AA	1-1½-43AA	1-1½-43AA
Thread Cutting Attachment R.H., including one Lead Screw and Nut	1-1½-70A	1-1½-70A	1-1½-70A
Additional parts for L.H. External Threading	5/886AR	5/886AR	5/886AR
Additional parts for R.H. Internal Threading	5/849AR	5/849AR	5/849AR
Additional lead Screw and Nut	5/83197/8	5/83197/8	5/83197/8
Double Movement Front Cross Slide	1-1½-47AA	1-1½-47AA	1/1½-47AA
Die Closing Stop to accomodate Namco Diehead	1-1½-81A	1-1½-81A	1-1½-81A
Spindle Brake Attachment—Two-speed (for "AL" type Machine only)	1-78A	1½-78A	2-78A
Spindle Brake Attachment—Single-speed (for "BL" type Machine only)	1-1½-110AR	1-1½-110AR	Not applicable
Longitudinal Turning Slide	1-1½-75A	1-1½-75A	1-1½-75A
Longitudinal Turning Attachment, L.H.	1½-133AR	1½-133AR	1½-133AR
Radial Tool Holder, R.H., complete, for Longitudinal Turning Attachment	1½-4091	1½-4091	1½-4091
Cross Drilling Attachment	1½-119AR	1½-119AR	1½-119AR
Rear End Threading Attachment	10S-146AR	10S-146AR	10S-146AR
TURRET TOOLS			
Adjustable Holder	ZG1-3650	ZG1-3650	ZG1-3650
Adjustable Holder and Turner	ZG1-3669	ZG1-3669	ZG1-3669
Radial Knee Tool (Solid Type) R.H.	ZG1-4048-2	ZG1-4048-2	ZG1-4048-2
Radial Knee Tool (Solid Type) L.H.	ZG1-4048-1	ZG1-4048-1	ZG1-4048-1
Tangential Knee Tools (Solid Type) R.H.	ZG1-3884-2	ZG1-3884-2	ZG1-3884-2
Tangential Knee Tools (Solid Type) L.H.	ZG1-3884-1	ZG1-3884-1	ZG1-3884-1
Knee Tool (Adjustable)	ZG1-3675	ZG1-3675	ZG2-4142
Tangential Turning Stem, R.H.	ZG1-4181-1	ZG1-4181-1	ZG2-4302-1
Tangential Turning Stem, L.H.	ZG1-4181-2	ZG1-4181-2	ZG2-4302-2
Roller Box Tool (Single Tool), R.H.	ZG1-3957-1	ZG1-3957-1	ZG1-3957-1
Roller Box Tool (Single Tool), L.H.	ZG1-3957-2	ZG1-3957-2	ZG1-3957-2
Roller Carrier, .187″ to .343″ capacity	ZG1-4366	ZG1-4366	ZG1-4366
Roller Carrier, .625″ to .875″ capacity	ZG1-4367	ZG1-4367	ZG1-4367
Box Tool (Vee Steady), R.H.	ZG1-3652	ZG1-3652	ZG1-3652
Box Tool (Vee Steady), L.H.	ZG1-3668	ZG1-3668	ZG1-3668
Centring and Facing Tool	ZG1-3667	ZG1-3667	ZG1-3667
Drill R.H. for above ½″ Diameter	ZG1-3667-2	ZG1-3667/2	ZG1-3667/2
Drill L.H. for above ½″ Diameter	ZG1-3667/4	ZG1-3667/4	ZG1-3667/4
Centring and Facing Tool with Vee Steady, R.H.	ZG1-3958-1	ZG1-3958-1	ZG1-3958-1
Centring and Facing Tool with Vee Steady, L.H.	ZG1-3958-2	ZG1-3958-2	ZG1-3958-2
Adjustable Boring Tool Holder	ZG1-4064	ZG1-4064	ZG1-4064
Drill Holder (Plain)	ZG1-3659	ZG1-3659	ZG1-3659
Tap Holder (Non-Releasing)	ZG1-3648	ZG1-3648	ZG1-3648
Tap Holder (Releasing)	ZG1-3987	ZG1-3987	ZG1-3987
Button Die Holder (Non-Releasing)	ZG1-4186	ZG1-4186	ZG1-4186
Button Die Holder (Releasing)	ZG1-4237	ZG1-4237	ZG1-4237
Stock Stop	1-1½-E15	1-1½-E15	1-1½-E15
Adjustable Stock Stop	ZG1-3674	ZG1-3674	ZG1-3674
Adjustable Revolving Stock Stop	ZG1-3888	ZG1-3888	ZG1-3888
Floating Reamer Holder	ZG1-4062	ZG1-4062	ZG1-4062
Recessing Swing Tool (Rear Slide Operated)	ZG2-4140	ZG2-4140	ZG2-4140
Recessing Swing Tool (Front Slide Operated)	ZG1-3655	ZG1-3655	ZG1-3655
External Swing Tool, R.H. (Front Slide Operated)	ZG1-3661S	ZG1-3661S	ZG1-3661S
External Swing Tool, L.H. (Front Slide Operated)	ZG1-4060	ZG1-4060	ZG1-4060
Back Rest for Swing Tools	ZG1-4061	ZG1-4061	ZG1-4061
Back Rest for Turret	ZG1-3710	ZG1-3710	ZG1-3710
Adjustable Knurl Holder	ZG1-3651	ZG1-3651	ZG2-4139
Recessing Tool	ZG1-4517	ZG1-4517	ZG1-4517
Self Opening Knurl Holder	ZG1-5946	ZG1-5946	ZG1-5946

Extras—Continued

	MACHINE		
	No. 98L	No. 138L	No. 168L
CROSS SLIDE TOOLS			
Tool Post for Circular Tools (Front)	ZG1-3713-1	ZG1-3713-1	ZG1-3713-1
Tool Post for Circular Tools (Rear)	ZG1-3713-2	ZG1-3713-2	ZG1-3713-2
Tool Post for Circular Tools with Worm Adjustment (Front)	ZG2-5738-1	ZG2-5738-1	ZG2-5738-1
Tool Post for Circular Tools with Worm Adjustment (Rear)	ZG2-5739-2	ZG2-5739-2	ZG2-5739-2
Tool Post for Square Tools (Front Slide, R.H.)	ZG1-4179	ZG1-4179	ZG1-4179
Tool Post for Square Tools (Front Slide, L.H.)	ZG1-4049	ZG1-4049	ZG1-4049
Tool Post for Square Tools (Rear Slide, L.H.)	ZG1-4068	ZG1-4068	ZG1-4068
Tool Post for Square Tools (Rear Slide, R.H.)	ZG1-4180	ZG1-4180	ZG1-4180
Tool Holder for Two Tools (Front, R.H.)	ZG1-4182	ZG1-4182	ZG1-4182
Tool Holder for Two Tools (Rear, R.H.)	ZG1-4184	ZG1-4184	ZG1-4184
Tool Holder for Two Tools (Front), L.H.	ZG1-4183	ZG1-4183	ZG1-4183
Tool Holder for Two Tools (Rear, L.H.)	ZG1-4185	ZG1-4185	ZG1-4185
Blade Cut off Tool Posts (Rear Slide, R.H.)	ZG1-3654	ZG1-3654	ZG1-3654
Blade Cut off Tool Posts (Rear Slide, L.H.)	ZG1-3712	ZG1-3712	ZG1-3712
Blade Cut off Tool Posts (Front Slide, R.H.)	ZG1-3711	ZG1-3711	ZG1-3711
Fixed Guide Plates, Side Fixing Type (Front Cross Slide)	ZG1-3666	ZG1-3666	ZG1-3666
Fixed Guide Plates, Raising Block Type (Front Cross Slide)	ZG1-3664	ZG1-3664	ZG1-3664
Fixed Guide Plates, side fixing type (Rear Cross Slide)	ZG2-4144	ZG2-4144	ZG2-4144
Fixed Guide Plates, Raising Block type (Rear Cross Slide)	ZG2-4138	ZG2-4138	ZG2-4138
Adjustable Guide Plates, Side Fixing Type (Front Cross Slide)	ZG1-3665	ZG1-3665	ZG1-3665
Adjustable Guide Plates, Raising Block Type (Front Cross Slide)	ZG1-3663	ZG1-3663	ZG1-3663
Side Knurl Holder	ZG1-3657	ZG1-3657	ZG1-3657
Top Knurl Holder	ZG1-3658	ZG1-3658	ZG1-3658
MISCELLANEOUS			
Cam Blank (Turret), 9″	1-1½E10	1-1½E10	1-1½E10
Cam Blank (Cross Slide), 7″	1-1½E11	1-1½E11	1-1½E11
Cam Blank (Third Slide), 7″	1-1½E12	1-1½E12	1-1½E12
Cut-off Blade for Third Slide	ZG1-3971	ZG1-3971	ZG1-3971
Cam Templates	ZG1-4114	ZG1-4114	ZG1-4114
Lever Templates	ZG1-3915	ZG1-3915	ZG1-3915
Low Ratio Gears, per pair	ZG1-3978/9	ZG1-3978/9	ZG1-3978/9
Speed Gears (Additional) per pair	—	—	—
Screw Slotting Saws:			
.062″ thick, 75 teeth	1½-2675/62	1½-2675/62	1½-2675/62
.084″ thick, 75 teeth	1½-2675/84	1½-2675/84	1½-2675/84
.093″ thick, 75 teeth	1½-2675/93	1½-2675/93	1½-2675/93
.144″ thick, 75 teeth	1½-2675/144	1½-2675/144	1½-2675/144
Straight Knurls ⅝″ o/dia. × ¼″ thick × ¼″ hole:			
47 teeth	ZG3047-7	ZG3047-7	ZG3047-7
41 teeth	ZG3047-8	ZG3047-8	ZG3047-8
35 teeth	ZG3047-9	ZG3047-9	ZG3047-9
29 teeth	ZG3047-10	ZG3047-10	ZG3047-10
24 teeth	ZG3047-11	ZG3047-11	ZG3047-11
19 teeth	ZG3047-12	ZG3047-12	ZG3047-12
Straight Knurls ¾″ o/dia. × ¼″ thick × ¼″ hole:			
97 teeth	ZG1-3657-2	ZG1-3657-2	ZG1-3657-2
82 teeth	ZG1-3657-3	ZG1-3657-3	ZG1-3657-3
68 teeth	ZG1-3657-4	ZG1-3657-4	ZG1-3657-4
57 teeth	ZG1-3657-5	ZG1-3657-5	ZG1-3657-5
45 teeth	ZG1-3657-6	ZG1-3657-6	ZG1-3657-6
Standard Blank Bushings: o/dia. Length			
¾″ 1″	ZG1-4352	ZG1-4352	ZG1-4352
1″ 1¼″	ZG1-4353	ZG1-4353	ZG1-4353
Cut-off Blades: Length Thickness Width			
5″ 3/32″ 11/16″	ZG1-3711-5	ZG1-3711-5	ZG1-3711-5

The policy of B.S.A. Tools Ltd. is one of continuous improvement. The right is reserved to alter the designs or constructional details of their manufactures at any time without giving notice.

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